$$\% \text{ error} = \frac{|K_1 - K_2|}{\frac{K_1 + K_2}{2}} \times 100\%$$

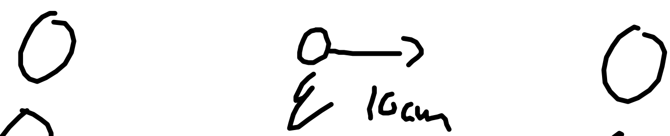
$\frac{K_1}{V_a}$ = slope part 1

$K_2 V_a$ = slope part 2

P456 Q13

60cm

0.20μC



$Q_1 = 30\mu C$ $Q_2 = 30\mu C$

~~$W = Fd$~~

F Not constant

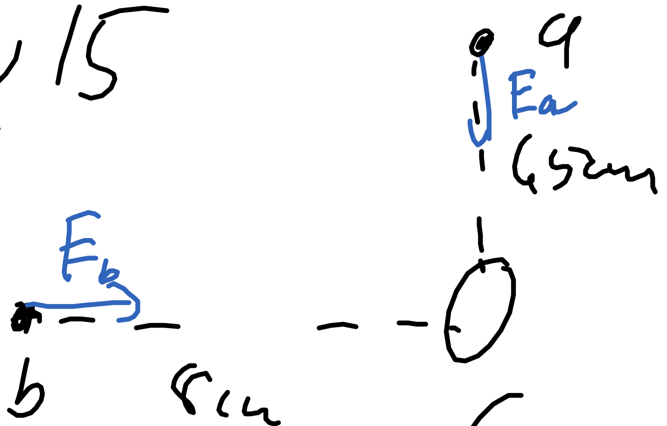
$$W = \Delta E_e = \left(\frac{kQ_1 q}{r_{f1}} + \frac{kQ_2 q}{r_{f2}} \right)$$

$$-\left(\frac{KQ_1 q}{r_{i1}} + \frac{KQ_2 q}{r_{i2}}\right)$$

$$KQq\left[\left(\frac{1}{r_{f1}} + \frac{1}{r_{f2}}\right) - \left(\frac{1}{r_{i1}} + \frac{1}{r_{i2}}\right)\right]$$

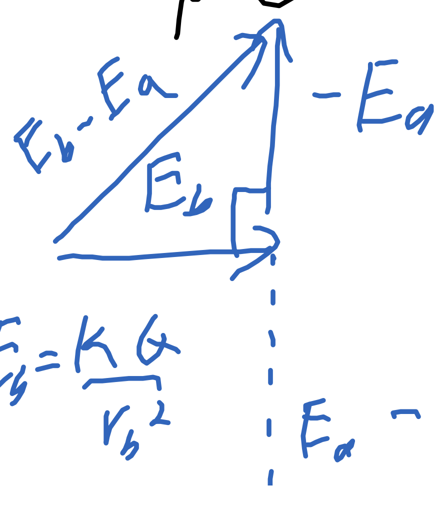
$$9\times10^{9}\,(30\times10^{-6})(0.2\times10^{-6})\left[\left(\frac{1}{0.2m} + \frac{1}{0.4m}\right) - \left(\frac{1}{0.3m} + \frac{1}{0.3m}\right)\right]$$

Q15



a) $KQ\left(\frac{1}{r_f} - \frac{1}{r_i}\right)$

$Q = -2.8\mu C$

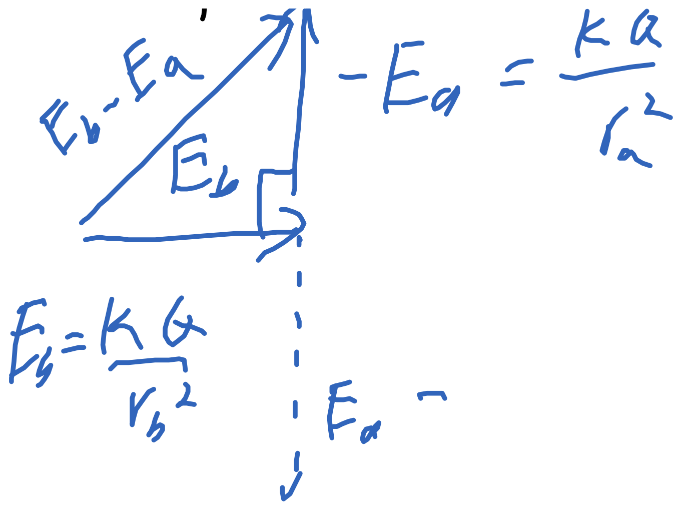


$$-E_a = \frac{KQ}{r_a^2}$$

$$E_b - E_1$$

$$E_b = \frac{KQ}{r_b^2}$$

$E_b - E_1$



Electric Current, I

Galvani - stuck metals into dead frogs, the legs twitch. Thought he had "life force".

Volta - 2 different metals in a electrolyte solution (eg. HCl solution) the metals have a potential difference - continues even as you discharge the terminals.

You can get a constant flow of charge.

Rate of flow of charge is called current, I.

$I = \Delta q/t$

Units: ampère, A = C/s

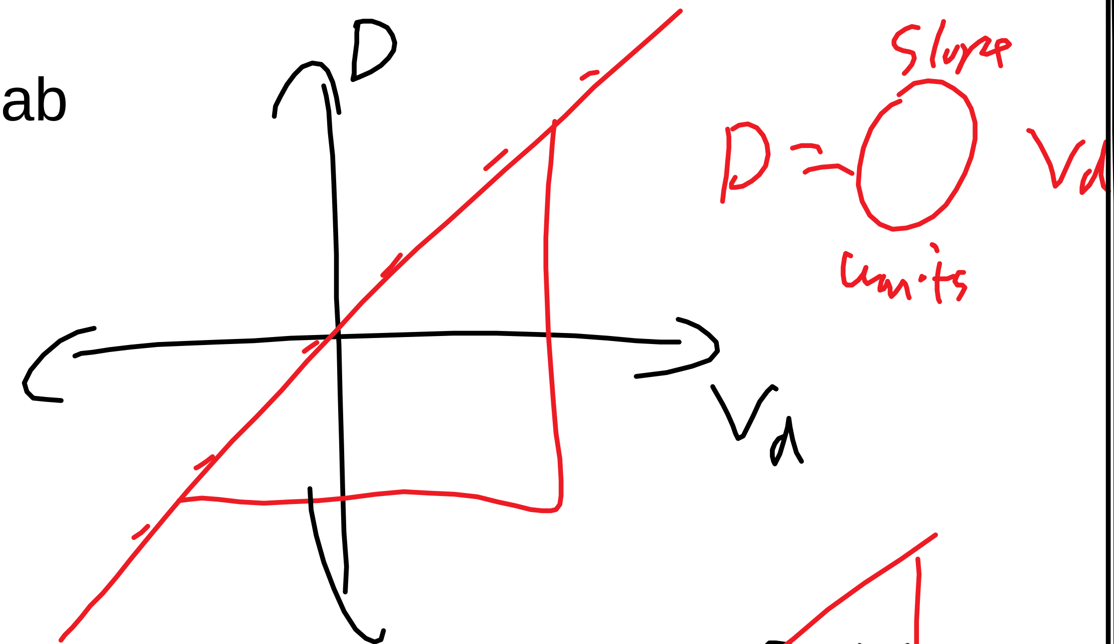
Homework:

P476 Q1-3
P477 Problems 1-9 odds
Lab due next class:
Purpose, hypothesis (include diagram and notes from class), procedure - say "refer to lab manual p75", data tables with units, graphs with equations and units and variables, % error calculation, conclusion, sources of uncertainty

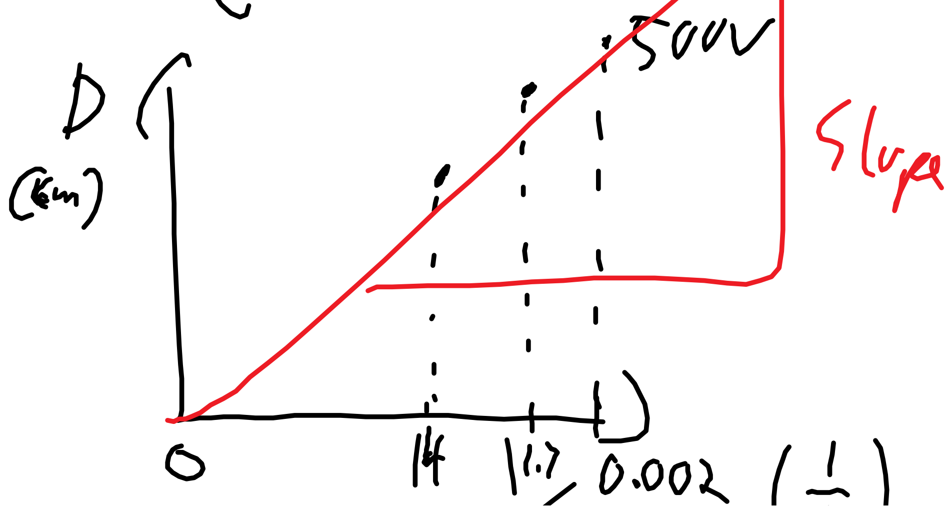
Field trip form.

Block 1-1 Lab

Part 1



Part 2



0   1.4   1.7   0.002 $\left(\frac{1}{V}\right)$

$1/V_a$

$D = \text{(slope units)} \frac{1}{V_a}$

$d_y =$

P456

$V = ?$ $E_K = 38\ keV$

$Q = 3.2 \times 10^{-19}\ C = 2e$

$V = \frac{E_e}{q}$ $\Delta E_K = \Delta E_e$

$E_K = Vq$

$V = \frac{38\,000\ eV}{2e} = \boxed{19\ kV}$

Q 15   60 cm   10 cm

$Q_1 = 30\mu C$ $\quad q = 0.2\mu C$ $\quad 30\mu C = Q_2$

$W = ?$

$W = \cancel{Fd} = q\cancel{Ed}$ ← not constant

$$W = \Delta E_e = E_{ef} - E_{ei}$$

$$E_{ef} = \left(\frac{KQ_1 q}{r_{1f}} + \frac{KQ_2 q}{r_{2f}}\right) - \left(\frac{KQ_1 q}{r_{1i}} + \frac{KQ_2 q}{r_{2i}}\right)$$

$$KQq\left[\left(\frac{1}{r_{1f}} + \frac{1}{r_{2f}}\right) - \left(\frac{1}{r_{1i}} + \frac{1}{r_{2i}}\right)\right]$$

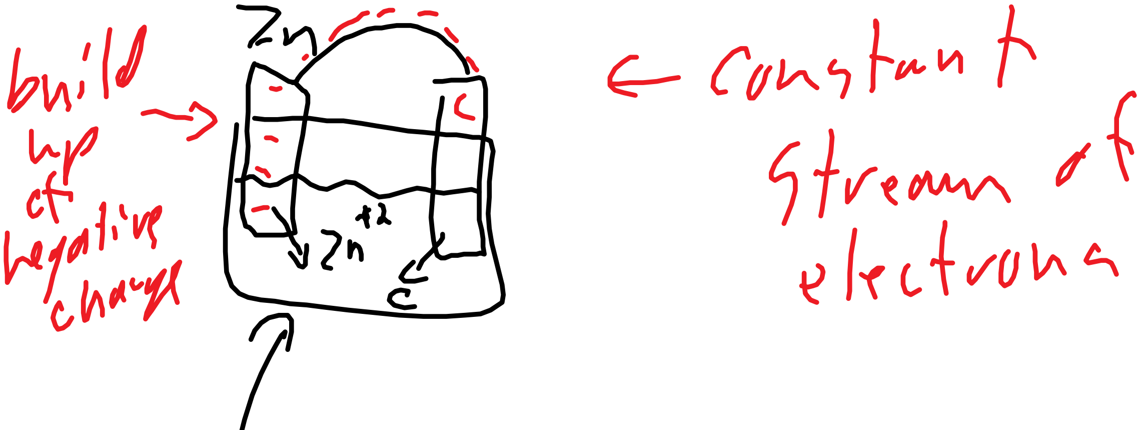
$$9\times10^{9}(30\times10^{-6})(0.2\times10^{-6})\left[\left(\frac{1}{0.4} + \frac{1}{0.2}\right) - \left(\frac{1}{0.3} + \frac{1}{0.3}\right)\right]$$

$9\times10^{9}(30\times10^{-6})(0.2\times10^{-6})\left[\left(0.4 \quad 0.2\right)\left(0.3 \quad 0.3\right)\right]$

Electric Currents, I

Galvani - iron spike in the spinal cord of a frog on a copper plate, the legs would twitch and jump even without a brain.
Galvani thought he had discovered the "life force". It didn't work if you used the same metal.

Volta - If you put different metals into a electrolyte solution (eg. HCl) there is a potential difference between the metals.



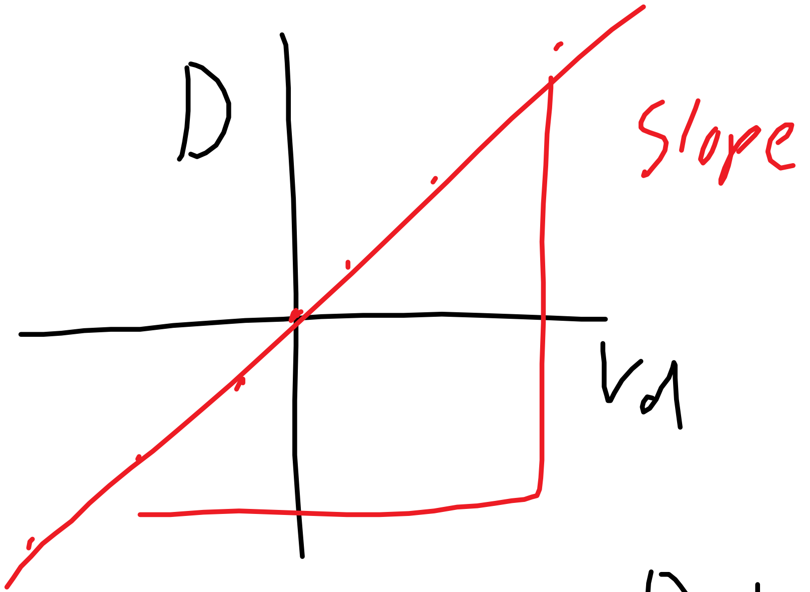
Cell → put in series for a battery

The rate of flow of charge is called the current, I.

I=Δq/Δt

Units: ampère, 1 A = 1 C/s

Lab due Friday
Questions HW
Quiz Tuesday: Voltage and energy
Electrical Current



$D \propto V_d$ $\qquad D \propto \frac{1}{V_a}$

$D = K \frac{V_d}{V_a}$

Part 1 $D = \frac{K_1}{V_n} V_d$ ← slope Part 1

Part 2 $D = K_2 V_d \frac{1}{V_n}$ ← slope part 2

$V_d = 5$ batteries

$$\% \text{ error} = \frac{|K_1 - K_2|}{\frac{K_1 + K_2}{2}} \times 100\%$$

Current Electricity

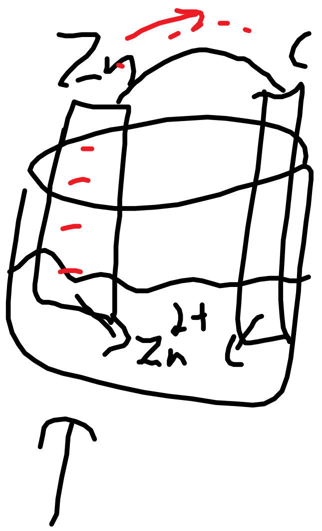
Story:

Galvani- Stuck dead frogs with iron and copper and they jumped. Thought he had discovered the life-force.

Volta - It isn't the life-force, it is a property of the metal and the solution (frog juices).
Two metals into an electrolyte solution (eg. HCl) they can have a potential difference.
Copper and aluminum V = 0.4V

Zinc and Carbon V = 1.4 V

What's the deal?



the Zinc goes into solution leaving a charge on the terminal.

electrochemical cell

- the current continues even as the terminal is discharged.

Current, I is the rate of transfer of charge, q.

$I = \Delta q / \Delta t$

Units: ampère, A   1A = 1C/s